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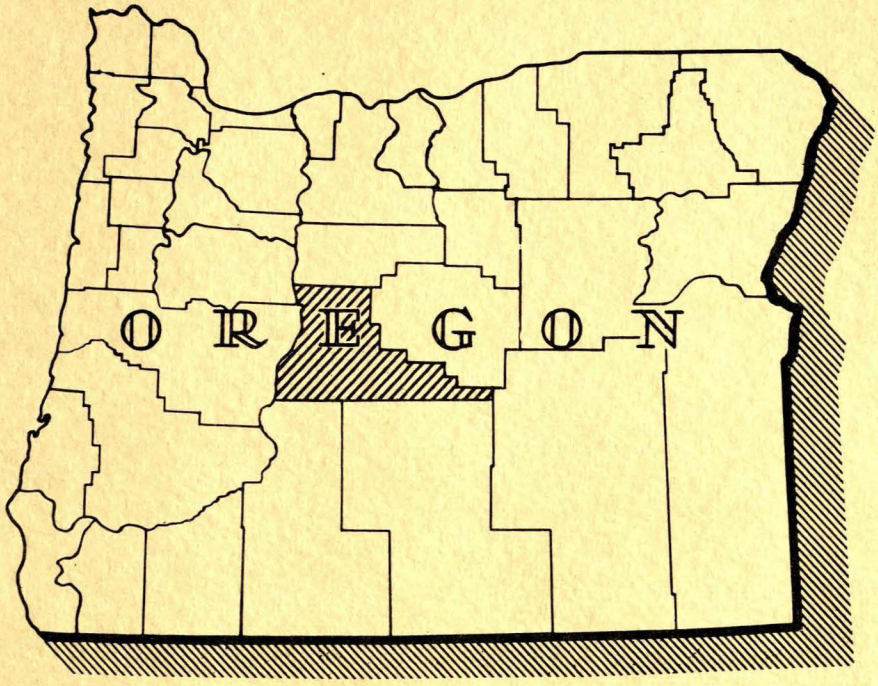
FOREST SURVEY REPORT NO. 116



U. S. DEPARTMENT OF AGRICULTURE · FOREST SERVICE

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION

R. W. COWLIN, DIRECTOR

PORTLAND, OREGON JULY 1954

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1/ Acknowledgment is made of cooperation from Public and private agencies in furnishing cutting and ownership records.

FOREST STATISTICS

FOR

DESCHUTES COUNTY, OREGON

Forest Survey Report No. 116

by

F. L. Moravets

U. S. Department of Agriculture Forest Service
Pacific Northwest Forest and Range Experiment Station

R. W. Cowlin, Director
July 1954

FOREWORD

This publication summarizes in statistical form the results of a reinventory of the forests of Deschutes County, Oregon, conducted in 1953. This reinventory is a part of the maintenance phase of the Forest Survey, a nationwide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928 and amended June 25, 1949. The purpose of the Forest Survey is to periodically inventory the extent and condition of forest lands and the timber and other products on them, to ascertain rates of forest growth and depletion, to estimate present consumption of timber products and to analyze and make available in reports survey information needed in the formulation of forest policies and programs.

The Forest Survey is conducted in the various forest regions of the Nation by the regional forest experiment stations of the Forest Service. In the Pacific Northwest region of Oregon and Washington it is an activity of the Pacific Northwest Forest and Range Experiment Station at Portland, Oregon.

Under the initial phase of the Forest Survey the forests of Deschutes County were inventoried in 1934. A statistical report, "Forest Statistics for Deschutes County, Oregon" and a detailed forest type map--scale 1 inch to the mile--were released. The reinventory was conducted during the months of May to August 1953. Another result of the reinventory is a revised forest type map of the county, on a scale of either 1 or 2 inches to the mile. 1/

1/ A print of the forest type map is available at cost of blueprinting. For information write Director, Pacific Northwest Forest and Range Experiment Station, P. O. Box 4059, Portland 8, Oregon.

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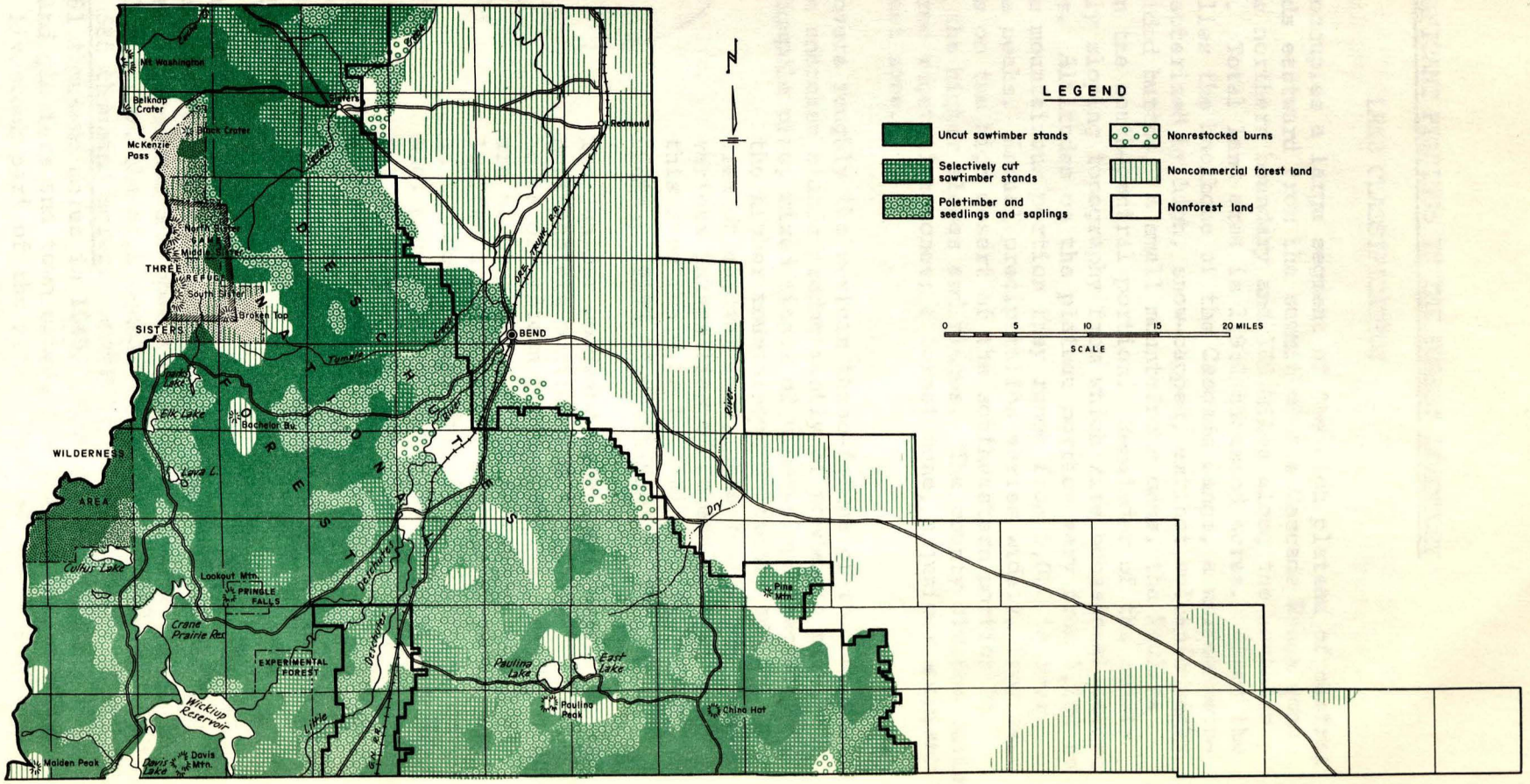
FIGURE 1

FOREST STAND-SIZE AND CONDITION CLASSES

DESCHUTES COUNTY, OREGON

1953

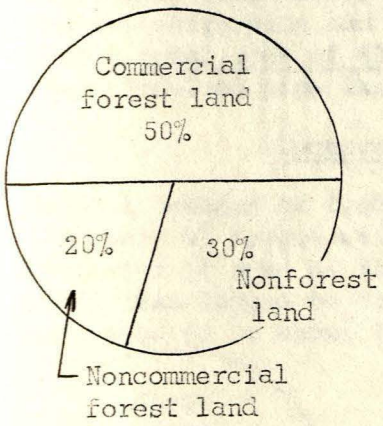


SIGNIFICANT FINDINGS IN THE FOREST INVENTORY

LAND CLASSIFICATION

Deschutes County occupies a large segment of the high plateau of central Oregon. It extends eastward from the summit of the Cascade Range some 35 miles along the northern boundary and 105 miles along the southern boundary (fig. 1). Total land area is 1,950 thousand acres. Along the western boundary lies the backbone of the Cascade Range, a narrow mountainous belt characterized by high, snow-capped, extinct volcanic peaks and lower steep-sided buttes. A small mountainous mass, the Paulina Mountains, lies in the south-central portion. Remainder of the county is a flat or gently sloping topography from which rise occasional abrupt cinder-cone buttes. Altitudes on the plateau portion vary from 2,500 to 5,000 feet; in the mountainous portion they range from 5,000 to over 10,000 feet on the peaks. Annual precipitation varies widely, from as little as 5 inches on the high desert of the southeastern portion to over 60 inches on the higher slopes and ridges. The county divides quite naturally into three vegetative zones; a forest zone, a juniper woodland zone and a nonforest zone.

The forest zone covers roughly the western three-fifths of the county and includes large unbroken stands predominantly of ponderosa pine, pure stands of lodgepole pine, mixed stands of upper-slope species on the higher mountainous portions, and a large area of cutover land, selectively cut under various intensities of selection. Within this zone there is a total of 969 thousand acres classed as commercial forest land.

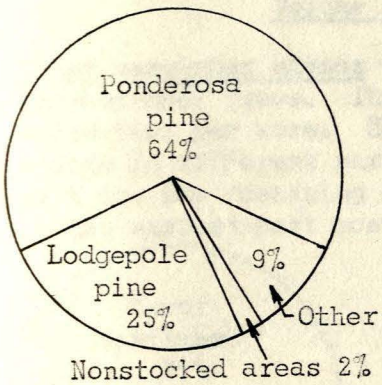


The juniper woodland zone lies chiefly in the northeastern portion and includes 282 thousand acres of western juniper stands. As the trees are of poor form, often defective, and have limited use, the juniper woodland is classed as a noncommercial forest. The juniper acreage, plus 35 thousand acres of subalpine forest type near the upper limits of tree growth, 12 thousand acres of sparse, poor-form timber on lava beds, and 67 thousand acres of reserved-productive forest land nearly all in the Three Sisters Wilderness Area, make a total of 396 thousand acres classed as noncommercial forest land.

The nonforest zone includes the broad sagebrush-covered flats and rolling hills of the southeastern portion, lands cleared for agricultural use, occasional natural meadows and open glades in the forest zone, and barren rock and glaciers on the high peaks and ridges. Total area of nonforest land is 585 thousand acres. According to the Bureau of Census, cropland totaled 61 thousand acres in 1949. With the exception of the mountain barrens and glaciers and town sites, the bulk of the nonforest land is grazed by livestock part of the year. Much of the commercial forest land and juniper woodland is also grazed seasonally.

Commercial Forest Land by Major Type

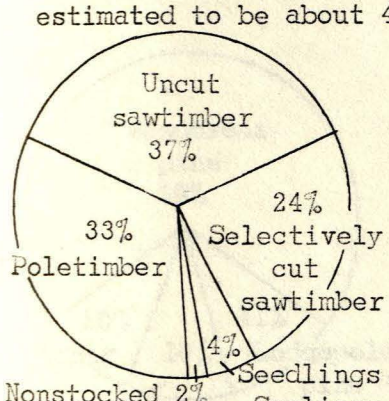
Deschutes County's commercial forest zone includes a large part of a broad belt of ponderosa pine forests stretching north and south across central Oregon. This pine type occupies the eastern slopes of the Cascade Range, from within a few miles of the summit of the range on the west to the arid land on the east. In general, the type lies between the 3,000-6,000-foot levels. In this county it varies in width from about 10 miles in the north to 60 miles in the south. The ponderosa pine type now occupies a total of 633 thousand acres. In the south-central portion of the county large bodies of pure lodgepole pine stands break up the continuity of the ponderosa pine type. Here lodgepole pine occupies the dry pumice flats; it also forms a quite heavily stocked understory in some of the ponderosa pine sawtimber stands. Other large areas of pure lodgepole pine are found on the upper slopes of the Cascade Range just above the ponderosa pine type. Total area of lodgepole pine type is 238 thousand acres.



On the upper slopes, just below the subalpine zone, several species occur either as pure stands over limited areas or in various mixtures. Mountain hemlock is the most prevalent of these; among others are white fir, noble fir, Pacific silver fir, subalpine fir, Engelmann spruce, western white pine and Douglas-fir. These types, grouped as "other," have a total area of 83 thousand acres. Nonstocked areas, largely cutover ponderosa pine land, total 15 thousand acres.

Commercial Forest Land by Stand-Size Class

Several decades of timber utilization, three of which between 1916 and 1946 were of large-scale magnitude, have very materially changed the character of some of the forests, especially the ponderosa pine type. Total area logged to date, by varying degrees of selection cutting, is estimated to be about 470 thousand acres, nearly half of the 969 thousand acres of commercial forest land. Selectively cut stands on 237 thousand acres, or half of the logged area, currently contain sufficient volume per acre to be classed as sawtimber. Uncut sawtimber stands cover 360 thousand acres, of which 57 percent is stocked by ponderosa pine, 22 percent by lodgepole pine and 21 percent by upper-slope species. Total area of poletimber stands is 317 thousand acres of which 180 thousand acres was logged for the original ponderosa pine sawtimber. Seedling and sapling stands cover 40 thousand acres, four-fifths of which is logged land. Of the 15 thousand acres of nonstocked area, nearly three-fourths is logged land and the remainder was deforested by fire. A few thousand acres that were logged have been cleared for agriculture or other nonforest use.

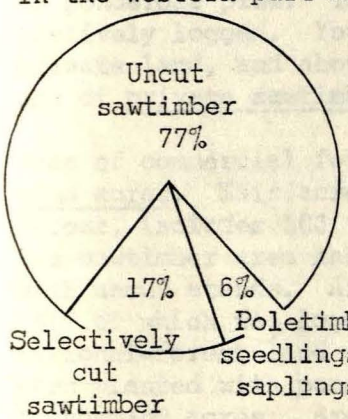


TIMBER VOLUME

Estimated net volume of live sawtimber trees (11 inches d.b.h. and larger) on commercial forest land totals 6,745 million board feet, log scale, Scribner rule. Net volume of growing stock (live trees 5 inches d.b.h. and larger, including both poletimber and sawtimber trees) is estimated to be 1,626 million cubic feet.

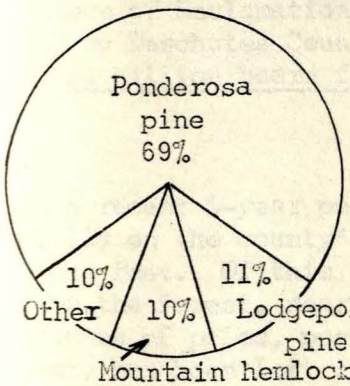
Volume of Sawtimber by Stand-Size Class

Uncut sawtimber stands contain a total volume of 5,154 million board feet in sawtimber trees. These stands average a little more than 14 thousand board feet per acre. However, there is wide variation in volume between stands in different parts of the commercial forest zone. In the eastern part the few remaining stands of uncut timber (fig. 1) are of low volume; in the western part most of the ponderosa pine stands are of high volumes. Mixed stands on the higher slopes are of low to medium volumes.



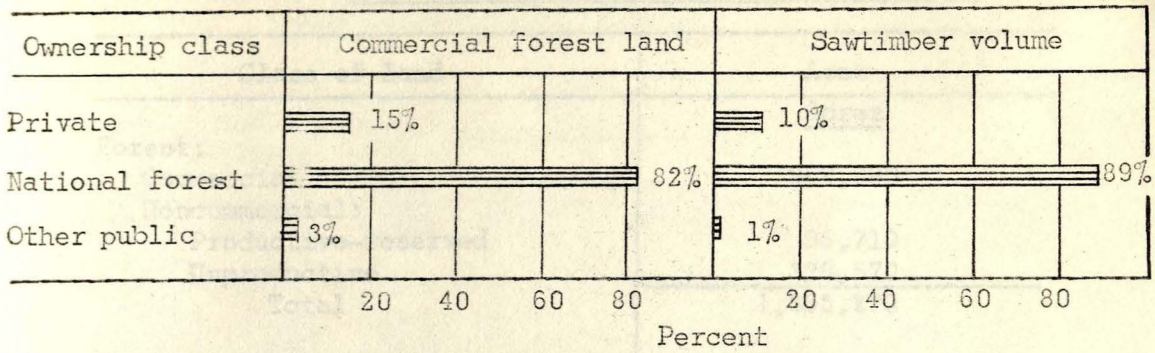
Volume in the selectively cut sawtimber stands totals 1,163 million board feet. In the eastern half of the commercial zone these stands, resulting from a heavy-selection cut in the earlier years of logging in the county, are of low volume. In the western half light-selection cuts have removed only a small portion of the original volumes of ponderosa pine stands. Average residual volume of the logged area is relatively low, about 5 thousand board feet per acre, due to the large area of heavy-selection cutting in the eastern part. Sawtimber trees in poletimber stands contain a total of 419 million board feet; average volume per acre is about 1.3 thousand board feet. Occasional sawtimber trees in the overstory of seedling and sapling stands contain a total of 9 million board feet. The average here is about 0.2 thousand board feet per acre.

Volume of Sawtimber by Species



Volume of the valuable species, ponderosa pine, is estimated to be 4,671 million board feet. Eighty-five percent of this volume is in uncut stands, 10 percent in residual trees in selectively cut stands and 5 percent in the overstory of small young-growth stands. A very large part of the 771 million board feet of lodgepole pine is in pure stands. There are small volumes in the understory of ponderosa pine and mixed upper-slope stands. Nearly all of the lodgepole pine volume is in trees less than 20 inches in diameter, breast height. Mountain hemlock, the most abundant of the species covering the high mountainous area, has a volume estimated at 679 million feet. The "other species," including four true firs, Douglas-fir, Engelmann spruce, western white pine, and sugar pine, have a combined volume of 624 million feet.

FOREST OWNERSHIP



Commercial forest land in private ownership totals 143 thousand acres. Of this area, 80 thousand acres is stocked with sawtimber stands chiefly of ponderosa pine. Three-fourths of the sawtimber acreage has been selectively logged. Young-growth stands occupy 58 thousand acres of the private land, and about 5 thousand acres are currently nonstocked. Volume of private sawtimber is estimated to be 665 million board feet.

Area of commercial forest land in national-forest ownership is 797 thousand acres. This acreage, all of which is in the Deschutes National Forest, includes 503 thousand acres of sawtimber stands. One-third of the sawtimber area has been selectively logged; two-thirds is stocked with uncut stands. Area of young stands is 284 thousand acres, more than half of which was logged on a heavy-selection basis prior to becoming national-forest land through exchange. Some of the exchanged land has been planted with ponderosa pine seedlings; plantations now cover about 2 thousand acres. Area currently nonstocked totals 10 thousand acres. Sawtimber volume on national-forest lands is estimated to be 5,986 million board feet.

Commercial forest land in "other public" ownership aggregates 29 thousand acres, almost half of which is stocked with sawtimber. Included are Federal lands administered by either the Bureau of Land Management or Bureau of Reclamation, and small acreages owned by the State of Oregon and by Deschutes County. Sawtimber volume in "other public" ownership is 94 million board feet.

TIMBER UTILIZATION

In a recent 5-year period, 1948-52, the volume of live sawtimber cut annually on the county's commercial forest land has averaged 42 million board feet. Of this volume 40 million, or 95 percent, has been removed from the forest, nearly all in the form of logs; there have been small volumes of poles, posts, and fuelwood. Two million board feet, or 5 percent, has been left in the woods in the form of logging residue (table 11). In contrast, earlier log production statistics show that in the 5 years 1925 to 1929 inclusive, a period of probable maximum rate of cutting in the county, the average annual volume of timber cut, including volume removed and volume of residue, was approximately 325 million board feet.

Table 1.--Land area by major classes of land, 1953

Class of land	Area
	Acres
Forest:	
Commercial	968,990
Noncommercial:	
Productive-reserved	66,710
Unproductive	329,570
Total	1,365,270
Nonforest	584,540
Total, all classes	1,949,810

Table 2.--Area of commercial forest land by ownership and stand-size class, 1953

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling and sapling stands	Nonstocked areas
	Acres	Acres	Acres	Acres	Acres
Private	143,330	80,460	54,070	4,200	4,600
State	1,220	700	400		120
County	2,310	440	1,590	280	
Federal:					
Bureau of Land Mgt.	22,580	11,540	10,360	320	360
Bureau of Reclamation	3,100	1,360	1,660	80	
National Forest	796,450	502,790	249,050	34,750	9,860
Total Federal	822,130	515,690	261,070	35,150	10,220
All ownerships	968,990	597,290	317,130	39,630	14,940

Table 3.--Area of commercial forest land by major forest type and stand-size class, 1953

Forest type	Total	Sawtimber stands		Pole-timber stands	Seedling and sapling stands	Non-stocked areas
		Large 1/	Small 2/			
	Acres	Acres	Acres	Acres	Acres	Acres
Ponderosa pine	633,270	318,810	119,070	160,000	35,390	
White pine	3,250	1,680	1,570			
Lodgepole pine	237,530		81,470	152,180	3,880	
Douglas-fir	910	910				
Fir-spruce	79,090	17,660	56,120	4,950	360	
Nonstocked areas	14,940					14,940
Total	968,990	339,060	258,230	317,130	39,630	14,940

1/ 21 inches d.b.h. and larger.

2/ 11 to 21 inches d.b.h.

Table 4.--Area of commercial and noncommercial forest land and nonforest land by cover type and ownership class, 1953

(Acres)

Survey type symbol	Cover type	Total	Unreserved							Reserved			
			Total	Private	State	County	Federal			Total	State	Municipal	Federal
							Bureau of Land Mgt.	Bureau of Reclamation	National Forest				National Forest
	ALL LANDS												
	Forest land	1,365,270	1,280,140	226,750	7,610	19,870	199,200	3,180	823,530	85,130	720	240	84,170
	Nonforest land	584,540	567,120	206,710	18,530	57,540	232,530	200	51,610	17,420	150		17,270
	Total	1,949,810	1,847,260	433,460	26,140	77,410	431,730	3,380	875,140	102,550	870	240	101,440
	COMMERCIAL FOREST LAND												
P4	Ponderosa pine large sawtimber	320,530	318,810	48,960	100	40	1,840	1,020	266,850	1,720		240	1,480
P3	Ponderosa pine small sawtimber	119,110	119,070	22,790	280	320	1,260		94,420	40	40		
P2	Ponderosa pine poletimber	160,040	160,000	39,160	280	1,390	2,250		116,920	40	40		
P1	Ponderosa pine seedlings and saplings	35,390	35,390	2,320		280	80		32,710				
W4	Western white pine large sawtimber	1,880	1,680	80					1,600	200			200
W3	Western white pine small sawtimber	1,850	1,570	1,280					290	280			280
LP3	Lodgepole pine small sawtimber	83,430	81,470	6,830	40	80	8,440	340	65,740	1,960			1,960
LP2	Lodgepole pine poletimber	165,350	152,180	14,830	120	200	8,110	1,660	127,260	13,170			13,170
LP1	Lodgepole pine seedlings and saplings	3,880	3,880	1,880			240	80	1,680				
D4	Douglas-fir small old-growth and large young-growth sawtimber (red fir)	910	910						910				
WF4	White fir large sawtimber	3,200	3,200						3,200				
WF3	White fir small sawtimber	2,200	2,200	80					2,120				
S4	Engelmann spruce large sawtimber	300	170						170	130			130
FM4	True fir-mountain hemlock large sawtimber	39,010	14,290	40	160				14,090	24,720			24,720
FM3	True fir-mountain hemlock small sawtimber	77,420	53,920	400	120				53,400	23,500			23,500
FM2	True fir-mountain hemlock poletimber	5,780	4,950	80					4,870	830			830
FM1	True fir-mountain hemlock seedlings and saplings	480	360						360	120			120
XO	Old clearcut area nonstocked	10,890	10,890	3,190	40		200		7,460				
F	Deforested by fire, nonstocked	4,050	4,050	1,410	80		160		2,400				
	Total	1,035,700	968,990	143,330	1,220	2,310	22,580	3,100	796,450	66,710	80	240	66,390
	NONCOMMERCIAL FOREST LAND												
J	Juniper	282,000	281,360	82,860	5,880	17,560	174,780	80	200	640	640		
SA	Subalpine	35,160	17,840	120					17,720	17,320			17,320
NR	Noncommercial rocky	12,410	11,950	440	510		1,840		9,160	460			460
	Total	329,570	311,150	83,420	6,390	17,560	176,620	80	27,080	18,420	640		17,780
	NONFOREST LAND												
A&G	Agriculture, grass and brush	525,810	525,390	198,520	18,450	57,540	232,330	200	18,350	420	60		360
O	Open--nonvegetative	58,730	41,730	8,190	80		200		33,260	17,000	90		16,910
	Total	584,540	567,120	206,710	18,530	57,540	232,530	200	51,610	17,420	150		17,270

Table 5.--Area of commercial forest land by generalized forest type and ownership class, 1953

(Acres)

Generalized forest type		Total	Unreserved							Reserved			
			Total	Private	State	County	Federal			Total	State	Municipal	Federal
							Bureau of Land Mgt.	Bureau of Reclamation	National Forest				National Forest
Conifer large sawtimber:													
Types P4, W4, D4, WF4	Uncut	239,700	212,930	12,670	160		440	120	199,540	26,770		240	26,530
S4, and FM4.	Selectively cut	126,130	126,130	36,410	100	40	1,400	900	87,280				
	Total	365,830	339,060	49,080	260	40	1,840	1,020	286,820	26,770		240	26,530
Conifer small sawtimber:	Uncut	172,700	146,920	7,350	160	80	8,270	340	130,720	25,780	40		25,740
Types P3, W3, LP3, WF3,	Selectively cut	111,310	111,310	24,030	280	320	1,430		85,250				
and FM3.	Total	284,010	258,230	31,380	440	400	9,700	340	215,970	25,780	40		25,740
Conifer poletimber:													
Types P2, LP2, FM2	On cutovers	179,960	179,920	48,850	280	1,590	5,560	870	122,770	40	40		
	On plantations	120	120						120				
	On other	151,090	137,090	5,220	120		4,800	790	126,160	14,000			14,000
	Total	331,170	317,130	54,070	400	1,590	10,360	1,660	249,050	14,040	40		14,000
Conifer seedlings and saplings:													
Types P1, LP1, FM1.	On cutovers	31,970	31,970	3,880		280	40	40	27,730				
	On plantations	1,650	1,650						1,650				
	On other	6,130	6,010	320			280	40	5,370	120			120
	Total	39,750	39,630	4,200		280	320	80	34,750	120			120
Burned-over areas, nonstocked:													
Types XO and F		14,940	14,940	4,600	120		360		9,860				
	Total	1,035,700	968,990	143,330	1,220	2,310	22,580	3,100	796,450	66,710	80	240	66,390

Table 6.--Net volume of live sawtimber[1/] and growing stock[2/] on commercial forest land by ownership class, 1953

Ownership class	Sawtimber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Private	665	731	169
State	8	9	2
County	4	4	1
Federal:			
Bureau of Land Mgt.	75	85	23
Bureau of Reclamation	7	8	3
National Forest	5,986	6,524	1,428
Total Federal	6,068	6,617	1,454
All ownerships	6,745	7,361	1,626

1/ Includes live trees 11.0 inches diameter breast height and larger measured in board feet.

2/ Includes live trees 5.0 inches diameter breast height and larger measured in cubic feet.

Table 7.--Net volume of live sawtimber and growing stock on commercial forest land by stand-size class, 1953

Stand-size class	Sawtimber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Sawtimber stands:			
Uncut	5,154	5,601	1,119
Selectively cut	1,163	1,264	288
Total sawtimber	6,317	6,865	1,407
Poletimber stands	419	485	215
Seedling and sapling stands	9	10	4
Nonstocked areas	*	1	*
Total	6,745	7,361	1,626

*Less than 500 thousand.

Table 8.--Net volume of live sawtimber and growing stock on commercial forest land by species, 1953

Species	Sawtimber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Softwoods:			
Ponderosa pine	4,671	5,055	844
Sugar pine	12	13	2
Western white pine	53	58	18
Lodgepole pine	771	902	425
Douglas-fir	76	80	12
Mountain hemlock	679	733	174
White fir	289	312	88
Pacific silver fir	7	8	2
Noble fir	55	60	20
Subalpine fir	24	26	18
Engelmann spruce	106	112	23
Total	6,743	7,359	1,626
Hardwoods:			
Black cottonwood	2	2	*
All species, total	6,745	7,361	1,626

*Less than 500 thousand.

Table 9.--Net volume of live sawtimber on commercial forest land by diameter-class group, species, and log rule, 1953

Diameter class and log rule	Total	Ponderosa pine	White pine Sugar pine	Other species
	- - Million board feet - -			
11.0" to 20.9" d.b.h.				
Scribner rule	2,205	852	41	1,312
International ¼-inch rule	2,511	988	44	1,479
21.0" to 30.9" d.b.h.				
Scribner rule	2,143	1,638	24	481
International ¼-inch rule	2,320	1,769	26	525
31.0" to 40.9" d.b.h.				
Scribner rule	1,666	1,508		158
International ¼-inch rule	1,769	1,598		171
41.0" d.b.h. and larger				
Scribner rule	731	673		58
International ¼-inch rule	761	700		61
All diameter classes				
Scribner rule	6,745	4,671	65	2,009
International ¼-inch rule	7,361	5,055	70	2,236

Table 10.--Net volume of all timber on commercial forest land by class of material and species group, 1953

Class of material	Total	Softwoods	Hardwoods
	Million cubic feet	Million cubic feet	Million cubic feet
Growing stock:			
Sawtimber trees:			
Sawlog portion	1,152	1,152	
Upper stem portion	87	87	
Total	1,239	1,239	*
Poletimber trees	387	387	
Total growing stock	1,626	1,626	
Other material:			
Sound cull trees	3	3	
Rotten cull trees	8	8	
Salvable dead trees	19	19	
Total other material	30	30	*
Total, all timber	1,656	1,656	*

* Less than 500 thousand.

Table 11.--Average annual timber cut from live sawtimber and growing stock on commercial forest land by species group for the period 1948-1952 incl.

Species group	Live sawtimber						Growing stock		
	Timber products	Logging residues	Timber cut 1/	Timber products	Logging residues	Timber cut 1/	Timber products	Logging residues	Timber cut 1/
	Thousand board feet, log scale, Scribner rule			Thousand board feet, International ¼-inch rule			Thousand cubic feet		
Softwoods	40,139	2,220	42,359	43,804	2,422	46,226	6,856	824	7,680
Hardwoods 2/									
Total	40,139	2,220	42,359	43,804	2,422	46,226	6,856	824	7,680

1/ Total of timber products and logging residues. Timber products is the portion of the inventory volume removed from the forest; logging residues is the portion cut or killed in logging and not removed from the forest.

2/ Hardwood cut insignificant.

FOREST SURVEY PROCEDURE

The procedures used in the reinventory of Deschutes County were materially different from the procedures used in the initial inventory. This change in procedures accounts for some significant differences in both the forest-area and timber-volume statistics obtained. Therefore, a brief description of the procedures used in each inventory seems desirable.

Initial Inventory

The initial inventory of the county was conducted in 1934 by what was known as the "compilation method." In this method existing information on forest types, timber cruises, logging records, and other pertinent data, were collected from private timber owners and various public agencies. These data were checked in the field for reliability, and were adjusted to the then existing specifications and standards of Forest Survey. Forest-type and timber-volume data for areas not covered by reliable existing information were obtained through field reconnaissance.

All land in the county was classified as either forest or nonforest. Forest land was further classified as commercial or noncommercial; the commercial was still further classified by forest type, stand-size or condition class, and in case of young growth, by stocking class. All such types and classes were mapped in place on 1-inch-to-the-mile base maps of each forested township. These township type maps were then superimposed over current ownership-status plats and dot counted to obtain forest-type area statistics by ownership class. Type delineations on the township maps were traced to a base map of the county to form a county forest type map. The commercial forest land was also classified as to site quality, or forest-productive capacity.

In-place, timber-volume estimates were based on existing cruises collected and adjusted to the Forest Survey standard, on field samples, and on ocular estimates. Cruises made by commercial cruisers were obtained for a large part of the privately owned timber in the county. Forest Service cruises were available for nearly all of the sawtimber on national forest lands except the mixed stands of species, other than ponderosa pine, occupying the upper slopes and ridges near the summit of the Cascade Range. Separate volume estimates were computed for each of the commercial tree species and for each ownership class. Methods used in this initial inventory do not permit a determination of accuracy of estimate.

Reinventory

In the reinventory in 1953 complete revision of the forest type map was accomplished through interpretation, classification, and field

mapping on aerial photos, flown in 1951, which covered nearly all of the forest land in the county. In the delineation of types on aerial photos, those whose classifications were in doubt were checked on the ground. Types, stand-size classes, and stocking classes were similar to those recognized in the initial inventory. However, the aerial photos facilitated mapping of much greater accuracy and detail than was possible through ground reconnaissance in the initial inventory. Type delineations on the aerial photos were transferred to a 2-inch county planimetric base map through use of a photo projector. The new type map was then superimposed over the current ownership-status map and a dot count made of forest type areas by ownership class.

Estimates of net volumes of live sawtimber, growing stock, sound cull, and salvable-dead material were calculated by applying average per-acre volumes to the appropriate forest-type acreages. The per-acre volumes for sawtimber stands and poletimber stands were obtained through a sampling procedure in which the stands were measured on randomly selected plots. Comparable sawtimber and poletimber volumes in seedling and sapling stands and on nonstocked areas were based on empirical estimates. In the random selection of samples each individual sawtimber or poletimber stand in the county had an equal chance of being selected. A sample consisted of a series of three one-fifth-acre circular plots spaced at 6-chain intervals. Intensity of the sampling was so designed as to produce a total estimate of volume with a specified sampling accuracy.

ACCURACY OF REINVENTORY DATA

Forest Area

In the reinventory of the county, in-place mapping of the forests and their classification by forest type, stand-size class, or condition class, were on the basis of 100-percent coverage. Thus no error due to sampling was involved. Errors due to techniques or judgment in the field and in office computation of data were possible, but difficult to evaluate. Throughout all phases of the work close supervision and frequent checks assured a high level of accuracy and uniformity of standards.

Timber Volume

The probabilities are about 19 out of 20 that the actual board-foot volume of live sawtimber, if measured by a 100-percent tree cruise, would be within plus or minus 19 percent of the estimated total of 6,745 million board feet. On this basis the actual total volume would be somewhere between 5,463 and 8,027 million board feet. The same probabilities exist for the estimated 1,626 million cubic feet of growing stock with a range of plus or minus 13.6 percent. Volume estimates by species, stand-size class, or other subdivision, have greater sampling errors than the county totals because smaller volumes are involved.

DIFFERENCE IN RESULTS OF INVENTORIES

Some of the differences in forest-type and timber-volume statistics resulting from the 1934 and 1953 inventories are due to actual physical change. Other differences are due to variations in procedures used, in interpretation and classification of forest conditions, and in standards of utilization. Because of these differences direct comparison of the statistics is not possible.

Forest Area

Forest-area statistics resulting from the two inventories are shown in the following table:

Inventory	Total forest land	Commercial forest land						Noncommercial forest land
			Sawtimber		Poletimber	Seedlings and saplings	Nonstocked area	
		Total	Uncut	Selectively cut				
	Thousands of acres							
1934	1,421	1,046	474	43	388	125	16	375
1953	1,365	969	360	237	317	40	15	396

The difference in total forest land acreage, a reduction of 56 thousand acres, occurred chiefly on lands stocked with a woodland type of western juniper. In 1934 the area of juniper woodland was 320 thousand acres; in 1953 it was 282 thousand, a decrease of 38 thousand. Limited areas of these lands were cleared during the interval for agricultural use and other lands, sparsely stocked with this species and classed as forest land in 1934, were classed as nonforest in 1953.

Total commercial forest land area in 1953 was smaller by 77 thousand acres than in 1934. More than three-fourths, 59 thousand acres, of this reduction of commercial forest area was due to the establishment of the Three Sisters Wilderness Area, near the summit of the Cascade Range; this acreage is now classed as reserved-productive forest land (noncommercial). The increase in noncommercial forest area due to the reclassification of land in the Wilderness Area was offset in part by the decrease in the area mapped as juniper woodland.

The area of sawtimber stands increased during the interval from 517 to 597 thousand acres. This increase of 80 thousand acres was due in part to the ingrowth movement of poletimber stands to sawtimber stands, especially in the lodgepole pine type. The significant increase in area of selectively cut sawtimber, from 43 to 237 thousand acres, is indicative of the large-scale cutting operations between inventories. In addition, some of the areas cut on a heavy-selection basis now support a residual volume of less than 1,500 board feet per acre in sawtimber trees; stands on such areas are classed as either poletimber or seedling or sapling, depending on the size of the trees.

Timber Volume

The respective estimates of total sawtimber volume, by species group, obtained in the two inventories are shown in the tabulation below:

Inventory	Live sawtimber volume of —			
	All species	Ponderosa pine	Lodgepole pine	Other species[1/]
	Million board feet, log scale, Scribner rule			
Initial, 1934	6,609	4,955	114	1,540
Reinventory, 1953	6,745	4,671	771	1,303

1/ Includes sugar pine, western white pine, Douglas-fir, mountain hemlock, the true firs, Engelmann spruce, and black cottonwood.

The 1934 estimate was based on private and national forest cruise data covering a large part of the sawtimber acreage and on ocular appraisals for the uncruised acreage. The 1953 estimate was based on a sampling procedure, as described on page 16.

Several factors have influenced the two respective estimates of timber volumes. One factor, undoubtedly of material significance, is the variation between inventories in procedures and specifications used in compiling the estimates. The 1953 estimate, for example, has a calculated sampling error (see page 16 under "Accuracy of Reinventory Data, Timber Volume"). However, no statistical evaluation of accuracy can be calculated for the 1934 estimate. Technique errors may have affected either one or both of the estimates.

A second factor is the drain on the timber inventory, during the interval, due to timber cutting and to the various natural depleting agencies—forest insects and diseases, windthrow, and fire. This drain materially reduced the timber inventory since 1934.

Another factor that reduced the commercial timber volume was the transfer of sawtimber stands from a commercial to a noncommercial category, due to the establishment of the Three Sisters Wilderness Area.

An offsetting factor is forest growth—net growth in sawtimber trees and the ingrowth of poletimber trees into sawtimber size. Also, tending to increase the 1953 estimate are a higher standard of utilization in the reinventory and the inclusion in it of volume of certain stands not included in the 1934 estimate.

Specific examples of the influence of some of the above factors follow.

The large difference in the respective volumes of lodgepole pine sawtimber is due chiefly to a change in interpretation of commercial

quality and in part to net growth of this species during the 19-year interval. In the 1934 inventory, the volume of commercial lodgepole pine was limited largely to the occasional sawtimber trees found in mixed types, predominantly of such species as ponderosa pine and mountain hemlock; commercial lodgepole pine volumes were assigned to only limited areas of the pure lodgepole pine type. In 1953, board-foot volumes were determined for all lodgepole sawtimber-size trees in both pure and mixed types and in all stand-size classes, including pole-timber and seedling and sapling stands.

The present estimated volume of the "other species" is lower than the 1934 estimate even though there has been practically no cutting in such stands. The decrease was due, at least in part, to the transfer of some of the sawtimber stands of mountain hemlock and the true firs on the higher upper slopes to a productive-reserved status which removed these volumes from the commercial category.

Because of these factors the two estimates are not on a comparable basis and do not reflect trends in timber volume.

DEFINITION OF TERMS USED

Land Area

Total Land

Includes dry land and unmeandered water surface.

Forest Land

Includes (a) land which is at least 10-percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; and (b) land from which the trees described in "(a)" have been removed to less than 10-percent stocking and which has not been developed for other use. Minimum area of forest land recognized in reinventory of the county was 10 acres.

Nonforest Land

Land that does not qualify as forest land. Minimum area recognized in the reinventory of the county was 10 acres.

Forest Land Classes

Commercial Forest Land

Forest land which is producing, or is physically capable of producing, usable crops of wood, economically available now or prospectively, and not withdrawn from timber utilization.

Noncommercial Forest Land

Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Productive-reserved. Forest land withdrawn from timber utilization through statute, ordinance, or administrative order, but which otherwise qualifies as commercial forest land.

Unproductive. Forest land incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Forest Types

Forest Type

A forest stand characterized by the predominance of certain key species--in terms of cubic volume for sawtimber and poletimber stands, and in number of trees for seedling and sapling stands--or a forest condition such as nonstocked cutover or burned-over land. In classifying forest land by type the minimum area recognized was 40 acres. The major forest types listed in table 3 are of the following composition:

Ponderosa pine. Stands comprised of 20 percent or more of ponderosa pine by cubic volume or number of trees.

White pine. Stands comprised of 20 percent or more of western white pine by cubic volume or number of trees.

Lodgepole pine. Stands comprised of 50 percent or more of lodgepole pine by cubic volume or number of trees.

Douglas-fir. Stands comprised of 50 percent or more of Douglas-fir by cubic volume or number of trees.

Fir-spruce. Stands comprised of 50 percent or more of one or more of the true firs (Abies spp.), Engelmann spruce, or mountain hemlock by cubic volume or number of trees.

Nonstocked areas. Cutover or burned-over areas on which the restocking, if any, is less than 10 percent density and which does not support a residual stand meeting minimum sawtimber requirements.

Tree Classes

Sawtimber Tree

Softwood or hardwood tree 11.0 inches d.b.h. or larger containing at least one 16-foot log to a variable top diameter inside bark approximating 40 percent of diameter breast height, but never less than 8 inches, and in which 25 percent or more of the gross board-foot volume is free from rot and defect.

Poletimber Tree

Softwood or hardwood tree 5.0 to 10.9 inches d.b.h. in which 25 percent or more of the gross cubic-foot volume is free from rot and defect.

Cull Tree

Live tree of sawtimber or poletimber size that is unmerchantable, now or prospectively, because of defect or rot.

Sound cull tree. Live tree of sawtimber or poletimber size which contains 25 percent or more of sound volume but will not make at least one merchantable log, now or prospectively, because of roughness or poor form.

Rotten cull tree. Live tree of sawtimber or poletimber size in which less than 25 percent of the total volume is sound.

Salvable Dead Tree

Standing dead or down tree which contains 25 percent or more of sound volume and at least one merchantable log.

Stand-Size Classes

Sawtimber Stand

Stand of sawtimber trees having a minimum net volume of 1,500 board feet, log scale, Scribner rule.

Large sawtimber stand. Stand in which the majority of the volume is in trees more than 21.0" d.b.h.

Small sawtimber stand. Stand in which the majority of the volume is in trees from 11.0" to 20.9" d.b.h.

Poletimber Stand

Stand failing to meet sawtimber-stand specifications but of at least 10-percent stocking of trees 5.0 inches d.b.h. and larger, with at least one-half the minimum stocking in poletimber trees (5.0 inches to 10.9 inches d.b.h.).

Seedling and Sapling Stand

Stand not qualifying as either sawtimber or poletimber stand but having at least 10-percent stocking of trees and with at least one-half the minimum stocking in seedlings and saplings (0-inch to 4.9 inches d.b.h.).

Uncut Sawtimber Stand

Stand that is essentially undisturbed by cutting.

Selectively Cut Sawtimber Stand

Stand in which a partial harvest has been made, and in which the residual volume amounts to 1,500 board feet per acre or more.

Timber Volume

Live Sawtimber Volume

Net volume in board feet of live sawtimber trees:

Scribner rule. The common board-foot rule used in determining log-scale volume of sawtimber in this region. This rule underestimates, particularly in case of timber of the smaller diameters, the volume of lumber that could be produced from the timber.

International ¼-inch rule. The standard board-foot rule adopted by the Forest Service in the presentation of Forest Survey volume statistics.

Growing Stock

Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Sawtimber Volume

Net volume in board feet of live and salvable dead sawtimber trees to a merchantable top.

All-Timber Volume

Net volume in cubic feet of live and salvable dead sawtimber trees and poletimber trees of commercial species, and cull trees of all species from stump to a minimum 4.0-inch top inside bark.

Commercial Tree Species

Tree species that are considered in determining stocking of stands and growing-stock volume. Includes species presently or prospectively usable for commercial timber products.

Commercial tree species in Deschutes County include:

Softwoods:

Ponderosa pine (Pinus ponderosa)
Sugar pine (Pinus lambertiana)
Western white pine (Pinus monticola)
Lodgepole pine (Pinus contorta)
Douglas-fir (Pseudotsuga menziesii)
White fir (Abies concolor and grandis)
Noble fir (Abies procera)
Pacific silver fir (Abies amabilis)
Subalpine fir (Abies lasiocarpa)
Mountain hemlock (Tsuga mertensiana)
Engelmann spruce (Pinus engelmannii)

Hardwoods:

Black cottonwood (Populus trichocarpa)

Timber Cut

Timber Cut from Live Sawtimber

Board-foot volume of live sawtimber trees removed from commercial forest land during a specified year as timber products and that left as logging residue.

Timber products. Board-foot volume of live sawtimber entering into timber products during a specified year.

Logging residue. Board-foot volume of live sawtimber that is cut or killed in logging during a specified year but is not removed from the forest as timber products.

Timber Cut from Growing Stock

Cubic-foot volume of live sawtimber and poletimber trees removed

from commercial forest land during a specified year as timber products and that left as logging residue.

Timber products. Cubic-foot volume of growing stock entering into timber products during a specified year.

Logging residue. Cubic-foot volume of growing stock that is cut or killed in logging during a specified year but is not removed as timber products.

Accuracy of Data

Sampling Error

A measure of the reliability of timber volume estimates based on the variability shown by sample measurements of the volume.

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